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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/714,909	11/18/2003	Hideo Takagi	032108	4001
38834	7590	07/28/2005	EXAMINER	
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP 1250 CONNECTICUT AVENUE, NW SUITE 700 WASHINGTON, DC 20036			DANG, PHUC T	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 07/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/714,909	TAKAGI ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	PHUC T. DANG	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on election filed on January 21, 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-6,8-11,13-16,18,19,21 and 22 is/are pending in the application.
- 4a) Of the above claim(s) 21 and 22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6,8-11,13-16,18 and 19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

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## **DETAILED ACTION**

### **Amendment**

1. Amendment filed on June 2, 2005 has been acknowledged and considered.

In Amendment, Applicants canceled claims 7, 12, 17 and 20 and amended claims 1 and 13 and withdrawn claims 21-22.

Claims 1-6, 8-11, 13-16, 18-19 and 21-22 are currently pending in the application.

### **Response to Arguments**

2. Applicant's argument filed on June 2, 2005 with respect to claims 1-6, 8-11, 13-16 and 18-19 have been considered but are moot in view of the new ground(s) of rejection.

### **Priority**

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### **Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 3, 16 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nomoto et al., hereinafter "Nomoto" (U.S. Publication No. US 2002/0137288 A1) in view of Allman et al., hereinafter "Allman" (U.S. Publication US 2003/0157765).

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Regarding claims 2, and 14, Nomoto discloses all the features of the claimed invention as discussed above, but does not disclose the plasma treatment is carried out over a duration of time of 40 seconds to 90 seconds.

Diodato, however, discloses the plasma treatment is carried out over a duration of time of 40 seconds to 90 seconds [col. 5, lines 61-65].

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the above discussed teaching of Nomoto as taught by Diodato for a purpose of improving a process of fabricating a semiconductor memory device.

Regarding claims 3, 8, 15 and 18, Diodato discloses after the formation of the charge storage film, a step of forming a contact hole (67, Fig. 8) through which a wiring connection (12-13, Fig. 8) is to be established, and then subjecting said film to the hydrogen plasma treatment through the contact hole (col. 6, lines 1+).

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the above discussed teaching of Nomoto as taught by Diodato for a purpose of improving a process of fabricating a semiconductor memory device.

Regarding claims 4 and 9, Diodato discloses plasma treatment is carried out before, during or after a barrier metal (Ti or TiN) is formed along the inner wall of the contact hole 67 (col. 7, lines 31-39).

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the above discussed teaching of Nomoto as taught by Diodato for a purpose of improving a process of fabricating a semiconductor memory device.

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Regarding claims 1 and 13, Nomoto discloses a method of fabricating a semiconductor memory device comprising the steps of:

forming a charge storage film (13, Fig. 4) for storing electric charge (see paragraph 0072); and

erasing electric charge stored in the charge storage film, wherein the charge storage film is any one of a silicon nitride film, a double-layered film comprising a silicon oxide film and a silicon nitride film, and a three-layered film comprising a silicon oxide film, a silicon nitride film and a silicon oxide film (see paragraph 0056-0059).

Nomoto discloses all the features of the claimed invention as discussed above, but does not disclose the erasing electric charge stored in the charge storage film by subjecting the charge storage to hydrogen plasma treatment.

Allman, however, discloses the erasing electric charge stored in the charge storage film by subjecting the charge storage to hydrogen plasma treatment (see paragraph 0017 and 0042).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the above discussed teaching of Nomoto as taught by Allman for a purpose of improving the electric field of the charge storage film.

Regarding claims 16 and 19, Nomoto discloses the annealing is carried out at 400°C or above (see paragraph 0128).

5. Claims 2-6, 8-11, 14-15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nomoto and Allman in view of Diodato et al., hereinafter "Diodato" (U.S. Patent No. 6,794,694).

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Regarding claims 5-6, 10-11, Diodato discloses the barrier metal has a thickness of 5 nm or less and the plasma treatment is carried out at 350-450°C (col. 7, lines 47-53).

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the above discussed teaching of Nomoto as taught by Diodato for a purpose of improving a process of fabricating a semiconductor memory device.

### Conclusion

6. Applicants are advised to cancel the non-elected claims 21-22 in response to the next Office action if the application is considered to be allowed.
7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuc T. Dang whose telephone number is (571) 272-1776. The examiner can normally be reached on 8:00 am-5:00 pm.
8. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Nelms can be reached on (571) 272-1787. The fax phone numbers for the organization where this application or proceeding is assigned are 571-273-8300 for regular communications and After Final communications.
9. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Phuc T. Dang

P.D.



Primary Examiner

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